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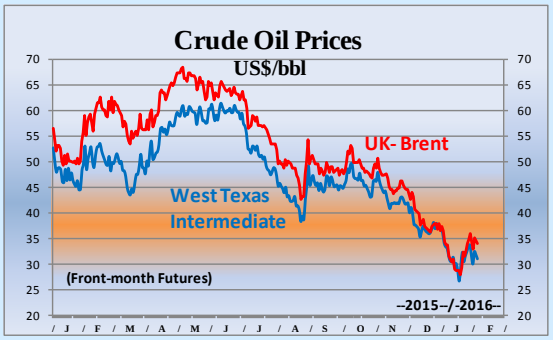
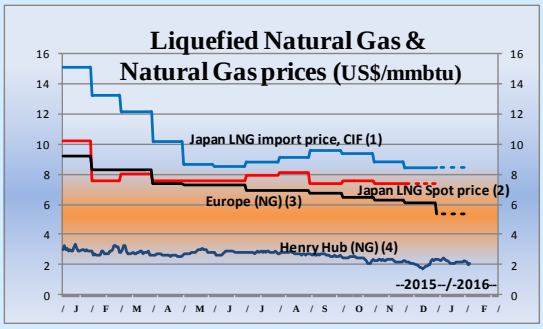
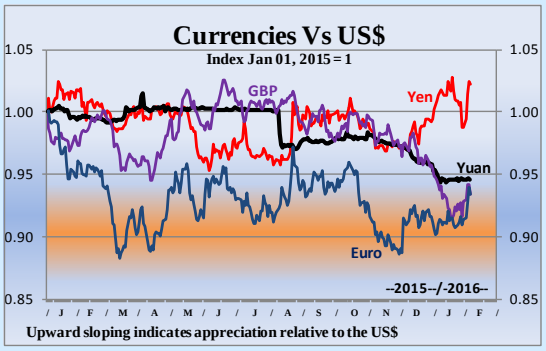


Source: Financial Times



Sources: (1) Ministry of Finance "Japan Trade Statistics"
(2) Ministry of Economy, Trade and Industry (contract month basis) (3) Estimated by World Bank and World Gas Intelligence
(4) DOE-EIA, NYMEX (Front-month Futures)



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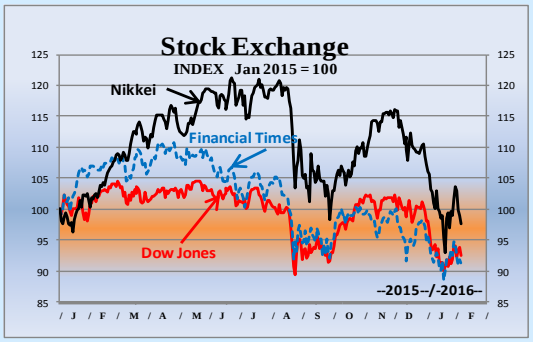

Source: Financial Times

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2. Developments in Nuclear Power

Takahama Unit 3 has been restarted, and other plants are also making progress. The electric utilities hope that the assessments will proceed smoothly for all plants so that they can be restarted soon. Discussions have begun on the management of Monju.

3. Recent Developments in the Oil and LNG Markets

The oil futures market is becoming even more pessimistic with the slowing of the Chinese economy and the lifting of the sanctions against Iran. There are signs of improvement in supply and demand, such as production cuts by non-OPEC countries, but not enough to overturn the bearish sentiment.

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With the adoption of the Paris Agreement, discussions have begun on Japan's efforts to address climate change, including Japan's global warming countermeasures plan and the Energy and Environmental Innovation Strategy.

5. Renewable Power Generation Prediction Technology Underpinning Grid Integration Measures

To enhance the grid integration measures such as curtailment, it is important to improve the accuracy of predicting the output of renewable power. As prediction services and technologies are commercialized, prediction accuracy is expected to improve.

1. Economic and Energy Outlook of Japan through 2016

Akira Yanagisawa, Senior Economist
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On December 18, the IEEJ released the Economic and Energy Outlook of Japan through 2016. This article discusses the outlook with a focus on the Reference Scenario.

The Japanese economy is projected to grow by 1.5% in FY2016, led by continuing domestic demand. Private consumption is recovering thanks to the improving employment situation and higher wages; capital investment is strengthening supported by higher corporate profits thanks to lower oil prices; and exports are benefiting from the yen's depreciation. However, the falling share prices since the beginning of the year and the slowing Chinese economy behind it are a concern.

Under the economic assumptions above, because of continued economic growth and the picking-up of electricity demand, the decline of energy supply of FY2016 will slow down and remain slightly below the level of last year despite the continuing energy saving. Natural gas and oil consumption for power generation will see a significant decline (-10%, -19%) as nuclear power plants are restarted. Final consumption will increase in the buildings sector by 0.4% due to economic recovery and the temperature effects. Consumption by industry will decrease because of continued energy conservation and reduced production in the energy-intensive petrochemical industry. The transport sector will consume less due to improved fuel efficiency and the rebound from the leap-year effect. Overall consumption will mark the sixth consecutive year of decrease.

By energy source, electricity sales for lighting services, mainly to households, will increase for the first time since the Great East Japan Earthquake due to the temperature factor and a more relaxed attitude towards saving electricity. Sales to industry will increase as economic activity picks up. The fall in electricity tariffs after the launch of full deregulation of retail electricity in April, despite the attention it is receiving, is not expected to have a major impact on overall power demand. City gas sales will increase reflecting the recovery of production activity and fuel switching, except for sales to electric utilities. The temperature factor will also push up sales. Overall sales will return to the highest level marked five years ago. Sales of heavy oil products will decrease because of the progressive switching of fuel and the use of naphtha will decrease because of reduced production of ethylene. Consequently, overall sales will fall below 180 GL for the first time in 47 years.

The rapid expansion of renewable power generating capacity is slowly subsiding, but the operating capacity by the end of FY2016 will reach 60 GW. The cumulative cost burden for 20 years could be JPY55 trillion if all of the approved 87.7 GW (of which 82.1 GW is solar PV) as of the end of July 2015 becomes operational. This is equivalent to an increase of JPY3,200/MWh: an increase of 14% for households and 19% for industrial consumers.

2. Developments in Nuclear Power

Tomoko Murakami, Manager
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In 2016, various policy measures will be launched as part of the efforts to achieve the energy savings In the run-up to restarting, Kansai Electric's Takahama Unit 3 conducted an emergency drill from January 11 to 13 assuming a severe accident, with the attendance of Nuclear Regulation Agency officials. The plant started the full-power operation on February 4.

Other plants are also making progress with their safety assessments. The 318th assessment meeting on January 15 discussed the on-site fault of Chugoku Electric's Shimane Nuclear Power Plant, and the Nuclear Regulation Authority (NRA) accepted Chugoku Electric's explanation that there are no faults on the site premises that could become active in the future. With the acceptance, the safety assessment for Shimane Unit 2 will now proceed to determining the seismic ground motion and assessing the facilities. The electric utilities hope that the assessments will proceed smoothly for Shimane Unit 2 and all other plants so that they can be restarted soon.

Discussions began on the safety management of the Monju fast breeder reactor for which the NRA pointed out problems in the operation system last year. At the first expert meeting of the Science and Technology Ministry on December 28, Chairman Akito Arima stressed the "need for a thorough investigation of the cause of the problem", and indicated that the issue will be investigated from various perspectives including the technological capabilities needed for operation and management, and how quality control and operation should be managed. In the second meeting on January 28, the technological capabilities required of the licensee was discussed, taking into account the role of Monju. The main focus of the discussions should be to clarify the safety requirements for a demonstration reactor in the development phase, instead of just finding the next licensee to replace the Japan Atomic Energy Agency.

Overseas, China is actively developing and expanding its nuclear business both at home and abroad. On December 26, 2015, Changjiang Unit 1 started commercial operation, and Fangchenggang Unit 1 and Yangjiang Unit 3 followed suit on January l, 2016, making China the world's fourth largest nuclear operator with 30 operating units generating approximately 28 GW. To leverage the steady accumulation of experience at home to spur overseas expansion, on December 30, Chinese nuclear firms CNNC and CGN established a fifty-fifty joint venture, Hualong International Nuclear Technology Co., Ltd. Hualong One, a plant concept that integrates the two companies' technologies, is already being constructed in Pakistan, with negotiations under way in several other countries. The company is competing over emerging countries with Japan and other developed countries having a plant concept of a similar output.

On January 19, Hitachi announced that it had formed a supply consortium with Bechtel and JGC Corporation for the new construction project in the UK. Being selected as the main supplier is an important milestone. This latest ABWR is the first plant to be exported from Japan to the UK, a country from which Japan originally imported nuclear technology. Continued steady progress of the project is keenly anticipated.

3. Recent Developments in the Oil and LNG Markets

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Oil prices are sliding unstoppably. On January 15, Brent and WTI slumped below $30/barrel while the international crude oil market fell to $20/barrel range for the first time in 13 years. A technical analysis of past price trends suggests that WTI will hover around $28/barrel for some time, but this projection may not be reliable in today's extremely bearish market.

The decline since the beginning of the year has been driven by the slowing Chinese economy and the lifting of the economic sanctions against Iran. These factors affected not real demand but the bearish sentiment of market players, causing oil prices to drop. Regarding the Chinese economy, the unstable Chinese stock market and the mounting downward pressure on the yuan since the beginning of the year are causing stock and money markets around the world to flee from risk. The situation is similar in the oil futures markets, where the long positions of money managers halved in the first two weeks of the year. Lower oil prices should normally be a benefit for China as the world's second largest oil importer, but attention seems to be focused on the fundamental structural issues of the economy.

The lifting of the economic sanctions against Iran on January 16 is also fueling pessimism in the market, which expects further easing of supply and demand. However, in reality, Iran's plan to export 500,000 barrels/day as soon as the sanctions are lifted will be difficult to achieve. The country is struggling to find buyers for its offshore condensate stock, which was expected to be shipped as soon as the sanctions were lifted, due to its high sulfur content. The Asian market, which was initially expected to absorb much of the additional supply from Iran, is saturated with Middle Eastern medium to heavy crude due to the introduction of the new oil Basrah Heavy by Iraq and its active sales strategy. Thus, whether Iran can increase production will depend largely on restarting its exports to the European market. However, as the demand for oil continues to decline in Europe, it is not clear how far Iran can reduce prices to compete with rival products such as Russian oil. Consequently, Iran's efforts to increase production will put further downward pressure on both Asian and European markets.

According to the International Energy Agency's Monthly Oil Market Report released on January 19, the monthly non-OPEC production dropped year-on-year for the first time since 2012, due partly to falling oil prices. The global oil demand continues to grow steadily and the market is consolidating due to low oil prices, but these factors are still not enough to turn around the market bears.

Oversupply is also continuing in the LNG market, with the Asian spot price falling below $6/MMBtu. Under such circumstances, on January 11, Australia's APLNG project shipped its first cargo as the third CBM-LNG project. With new LNG supplies such as these entering the market, the oversupply in the market is unlikely to end soon.

4. Update on Policies Related to Climate Change

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With the adoption of the Paris Agreement, discussions began on Japan's efforts to address climate change.

On December 22, 2015, the Global Warming Prevention Headquarters decided its policy on Japan's efforts to address climate change based on the Paris Agreement, thus initiating efforts to formulate, by spring 2016, Japan's global warming countermeasures plan for achieving its INDC for FY 2030. The Paris Agreement has set 2°C as the long-term temperature goal. To achieve this, the countries will together aim to achieve a balance between anthropogenic emissions and removals, to reach net zero emissions in the latter part of this century. Based on this goal, Japan, too, must make a contribution to reducing global emissions in a long-term and strategic perspective. Thus, the decision was made to identify promising areas for developing innovative technologies to enhance R&D by formulating the Energy and Environmental Innovation Strategy.

Prior to the decision, the WG for Formulating the Energy and Environment Innovation Strategy was established under the Cabinet Office's Council for Science, Technology and Innovation, and its first meeting was held on December 15, 2015. The meeting stressed the need to draw up a long-term technology development strategy to drastically reduce emissions. As examples of target technologies, nine areas were identified including next-generation PV, hydrogen (production, storage/transportation, and usage), superconductivity, and carbon capture and utilization (CCU). The target technologies will be short-listed and specific strategies will be developed by March 2016.

A joint meeting of the Global Environment Committee under the Central Environment Council and the Global Environment Subcommittee under the Industrial Structure Council was also held on December 22, 2015, and a draft plan for global warming countermeasures was presented. The plan indicated that the nationwide emissions trading system must be considered cautiously in view of the burden on domestic industry and jobs, the status of existing emissions trading systems overseas and their effects, and the evaluation of pre-existing domestic global warming countermeasures (such as the voluntary efforts of industries).

Regarding this issue, IEEJ Chairman and CEO Masakazu Toyoda said: "The emissions trading system should not be included in the draft plan. The system has not been successful yet. Even in cases where GHG have gone down, the likely reason is economic slowdown, and not the system. Further, according to a report commissioned by the European Commission, most of the interviewees judged that the emissions trading systems were not serving as drivers to reduce emissions."

To achieve the FY 2030 reduction target in Japan's INDC, it is essential to steadily implement various measures for achieving the 2030 Energy Mix. At the same time, for the longer-term goal of drastically reducing emissions as early as possible within this century, it is important to contribute to the global emissions reduction by ramping up investments in developing innovative technologies such as artificial photosynthesis and CCU.

5. Renewable Power Generation Prediction Technology Underpinning Grid Integration Measures

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As renewable capacity increases, the need to develop concrete measures for resolving grid integration restrictions is growing. Currently, METI is subsidizing projects such as the "Demonstration of next-generation interactive output control" for ensuring smooth output control, and "Assistance for introduction of battery systems by renewable electricity producers" for absorbing excess electricity and output fluctuations. Meanwhile, to enhance the grid integration measures effectively, it is important to figure out the output of renewable electricity in advance. This report discusses the technological developments for predicting the output.

Predictions of solar electricity output have long been used for assessing business viability. However, this only requires a rough estimation of annual solar power generation, which can be done using past insolation data from the AMeDAS meteorological observation system.

On the other hand, grid integration measure enhancement requires more accurate predictions at daily and hourly levels, and the demand for this level of prediction is growing. If power generation output can be predicted the day before, it would be much easier to set grid operation plans, including plans for backup thermal power operation and solar power curtailment. This would be very useful for electric utilities. To improve the accuracy of this prediction technology, METI implemented a three-year demonstration development project from FY 2011. At the follow-up meeting of this project last September, it was confirmed that the error of insolation estimation had improved to 5% or less per year.

While prediction technology must be improved continuously, the commercialization of prediction services and systems embedded with prediction technology is accelerating. Last March, the Japan Weather Association launched the SOLASAT-Nowcast service, which provides prediction data on insolation and solar PV power generation output to electricity producers. The service predicts up to six hours ahead using images of Japan from the Himawari weather satellite, and dividing them into 1 square kilometer grids. The prediction is updated every 30 minutes. The service can be up to 30% more accurate than conventional predictions using insolation data from AMeDAS. Further, last autumn several companies started selling a HEMS system that automatically controls the electricity storage system by predicting the next day's solar PV power generation output based on weather forecasts.

Currently, the error for day-ahead power generation output predictions is 15–20% for solar PV and 10–15% for wind power, so there is still much room for improvement as the error for power demand predictions is 2–3%. Further commercialization of prediction services will hopefully lead to the accumulation of much weather and output data and further improvements in prediction accuracy.

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